



Part I: (MCQ) Please choose the correct answer: (1 point each)

What is the primary form in which CO₂ is transported in the blood?

- (a) physically dissolved.
- (b) bound to hemoglobin.
- (c) bound to plasma protein.
- (d) as bicarbonate.
- (e) as carbonic anhydrase.

Physiology II
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Which conditions exists at high altitudes?

- (a) histotoxic hypoxia.
- (b) hypoxic hypoxia.
- (c) anemic hypoxia.
- (d) hypocapnia.
- (e) None of these answers.

Hypercapnia

- (a) refers to excess CO₂ in the arterial blood.
- (b) occurs when CO₂ is blown off to the atmosphere at a rate faster than it is being produced by the tissues.
- (c) may be caused by hypoventilation.
- (d) Both (a) and (b) above.
- (e) Both (a) and (c) above.

Which of the following statements concerning the dorsal respiratory group (DRG) is correct?

- (a) the DRG consists of both inspiratory neurons and expiratory neurons.
- (b) the neurons of the DRG remain inactive during normal quiet breathing.
- (c) the DRG is called into play by the VRG as when demands for ventilation are increased.
- (d) All of these answers.
- (e) None of these answers.

Select the factor in the arterial blood that has the largest effect on increasing the rate of respiration.

- (a) The hydrogen ion concentration in the kidney ECF increases.
- (b) The hydrogen ion concentration in the ECF generally increases.
- (c) The partial pressure of carbon increases.
- (d) The partial pressure of oxygen drops to 90.

Vasa recta are associated with

- (a) afferent arterioles.
- (b) efferent arterioles.
- (c) cortical nephrons.
- (d) juxtamedullary nephron.
- (e) renal papillae.

The filtration coefficient

- (a) is a measure of the surface area and permeability of the glomerular membrane.
- (b) is a constant value.
- (c) can be varied by contraction of the podocytes and mesangial cells.
- (d) Both (a) and (b) above.
- (e) Both (a) and (c) above.

Filtrate passes through all of these except

- (a) glomerular capillary pores.
- (b) basement membrane.
- (c) podocytes.
- (d) filtration slits.
- (e) None of these answers.

The glomerular capillary blood pressure in the nephron is 78 mm Hg. The Bowman's capsular hydrostatic pressure is 24 mm Hg. The colloidal osmotic pressure is 18 mm Hg. The net filtration pressure is ___ mm Hg.

- (a) 18
- (b) 26
- (c) 36
- (d) 42
- (e) 78

0. Stimulation of the macula densa cells

- (a) results in vasodilation of the afferent arteriole.
- (b) results in vasoconstriction of the afferent arteriole.
- (c) increases GFR.
- (d) Both (a) and (b) above.
- (e) Both (a) and (c) above.

1. Extrinsic control of the GFR

- (a) is mediated by sympathetic nervous system input to the afferent arterioles.
- (b) is aimed at the regulation of arterial blood pressure.
- (c) does not require a special mechanism but occurs as part of baroreceptor reflex.
- (d) Both (a) and (b) above.
- (e) All of these answers.

2. Tubular maximum (T_m)

- (a) is the maximum amount of a substance that the tubular cells can actively transport within a given time period.
- (b) is the maximum rate at which a substance is filtered at the glomerulus.
- (c) occurs when the membrane carrier becomes saturated.
- (d) Both (a) and (c) above.
- (e) Both (b) and (c) above.

- Given the following data for substance X (GFR = 125 ml/min, T_m = 125 mg/min, at a plasma concentration of 200 mg/100 ml), how much of substance X is filtered, reabsorbed, and excreted?
- (a) 200 mg/min filtered, 125 mg/min reabsorbed, 75 mg/min excreted
 - (b) 250 mg/min filtered, 125 mg/min reabsorbed, 125 mg/min excreted
 - (c) 125 mg/min filtered, 125 mg/min reabsorbed, 0 mg/min excreted
 - (d) 250 mg/min filtered, 200 mg/min reabsorbed, 50 mg/min excreted
 - (e) None of these answers.
- Which of the following plasma constituents is not regulated by the kidneys?
- (a) glucose
 - (b) Na^+
 - (c) H^+
 - (d) phosphate
 - (e) water
6. Atrial natriuretic peptide
- (a) is secreted by the heart when atrial pressure is high.
 - (b) results in an increased glomerular filtration rate.
 - (c) inhibits aldosterone activity.
 - (d) Both (a) and (b) above.
 - (e) All of these answers.
7. Which of the following statements concerning water reabsorption is correct?
- (a) water reabsorption is under control of vasopressin throughout the length of the nephron.
 - (b) the ascending limb of the loop of Henle is always impermeable to water.
 - (c) vasopressin makes the distal and collecting tubules impermeable to water.
 - (d) fifteen percent of the filtered water osmotically follows the absorption of Na^+ and other solutes in the proximal tubule.
 - (e) water reabsorption is passive in the early portions of the nephron but is active in the distal portions of the nephron.
7. Plasma clearance is the
- (a) time required to filter blood in the glomerulus.
 - (b) amount of a substance appearing in the urine in one minute of time.
 - (c) amount of a substance that is filtered in one minute of time.
 - (d) amount of a substance secreted in one minute of time.
 - (e) volume of plasma that is completely cleared of a substance by the kidneys in one minute of time.
8. The ascending limb of the loop of Henle is where
- (a) NaCl passively leaves the tubular fluid down its concentration gradient.
 - (b) NaCl is actively transported into the interstitial fluid, leaving water behind because the tubular cells are not permeable to water.
 - (c) K^+ is secreted.
 - (d) aldosterone stimulates Na^+ reabsorption.
 - (e) None of these answers.

Vasopressin secretion

- (a) induces the kidneys to produce a small volume of concentrated urine.
- (b) is stimulated when the body fluids are hypertonic.
- (c) is inhibited when the arterial blood pressure is dangerously low.
- (d) Both (a) and (b) above.
- (e) All of these answers.

When the bladder of an infant is filled with urine, the

- (a) stretch receptors in the bladder wall are inhibited.
- (b) parasympathetic nerve supplying the bladder is inhibited, allowing the bladder to relax.
- (c) motor neuron supplying the external urethral sphincter is stimulated, causing the sphincter to open.
- (d) motor neuron supplying the external urethral sphincter is inhibited, allowing the sphincter to open.
- (e) parasympathetic nerve supplying the internal urethral sphincter is stimulated, causing the sphincter to close.

Mixing movements

- (a) promote digestion by mixing food with digestive juices.
- (b) facilitate absorption by exposing luminal contents to absorptive surfaces.
- (c) take place only in the stomach.
- (d) promote digestion by mixing food with digestive juices and facilitates absorption by exposing luminal contents to absorptive surfaces.
- (e) All of these answers.

2. Which of the following statements concerning the intrinsic plexuses is incorrect?

- (a) The myenteric plexus is located in the submucosa.
- (b) The plexuses innervate smooth muscle and exocrine and endocrine gland cells.
- (c) The plexuses are influenced by extrinsic nerves.
- (d) The plexuses coordinate local digestive tract activity.
- (e) There are two major networks of nerve fibers forming the plexuses of the gut.

3. The BER refers to the

- (a) basic eating reflex, which ensures that food is moved along the digestive tract at an appropriate rate.
- (b) basic electrical rhythm consisting of spontaneous, rhythmic, wavelike fluctuations in membrane potential.
- (c) basic emptying reflex, which governs the rate of gastric emptying.
- (d) bowel evacuation reflex, or defecation reflex.
- (e) None of these answers.

4. Salivary secretion is

- (a) entirely under neural control (there is no hormonal control of salivary secretion).
- (b) a passive secretion.
- (c) stimulated by the parasympathetic nervous system and inhibited by the sympathetic nervous system.
- (d) Two of these answers.
- (e) All of these answers.

The parietal cells of the gastric mucosa secrete

- (a) HCl.
- (b) pepsinogen.
- (c) intrinsic factor.
- (d) Both HCl and pepsinogen.
- (e) Both HCl and intrinsic factor.

Which factor below does not slow down gastric activities?

- (a) enterogastric reflex.
- (b) enterogastrones.
- (c) secretin.
- (d) gastrin.
- (e) cholecystokinin.

Which statement regarding control of pancreatic secretion is correct?

- (a) gastrin stimulates release of neutralization solution.
- (b) CCK stimulates release of enzymes.
- (c) secretin stimulates release of bicarbonate.
- (d) Both (a) and (b) above.
- (e) Both (b) and (c) above.

Which of the following does not occur during vomiting?

- (a) the diaphragm contracts.
- (b) the abdominal muscles contract.
- (c) the stomach contracts.
- (d) respiration is inhibited.
- (e) the glottis is closed.

The intestinal hormone secretin is released by endocrine cells in the duodenal mucosa in response to

- (a) distention of the stomach.
- (b) carbohydrate in the duodenum.
- (c) acid in the duodenum.
- (d) gastrin secreted by the pyloric gland area of the stomach.
- (e) None of these answers.

Which of the following statements concerning secretin is correct?

- (a) the most potent stimulus for secretin secretion is the presence of fat in the duodenum.
- (b) secretin stimulates pancreatic enzyme secretion.
- (c) secretin stimulates the secretion of bicarb.
- (d) secretin stimulates the acinar cells.
- (e) None of these answers.

Which of the following stimulates gallbladder contraction?

- (a) CCK.
- (b) secretin.
- (c) sympathetic stimulation.
- (d) Both (a) and (c) above.
- (e) Both (b) and (c) above.

Which control mechanism brings about segmentation of the terminal portion of the small intestine?

- (a) gastroileal reflex.
- (b) distention of the stomach.
- (c) gastrin action.
- (d) Both (a) and (b) above.
- (e) All of these answers.

Lactose intolerance is

- (a) caused by lack of a specific disaccharidase.
- (b) caused by lack of lactose.
- (c) results in bacterial metabolism of lactose.
- (d) Both (a) and (b) above.
- (e) Both (a) and (c) above.

The defecation reflex

- (a) is initiated when mass movements force fecal material into the rectum, stimulating stretch receptors in the rectal wall.
- (b) involves relaxation of the internal anal sphincter and contraction of the sigmoid colon and rectum.
- (c) can be overridden by voluntary contraction of the external anal sphincter.
- (d) Both (a) and (b) above.
- (e) All of these answers.

i. The small intestinal brush-border cells contain the following enzymes:

- (a) lactase, sucrase, and enterokinase.
 - (b) lipase, lactase, and maltase.
 - (c) lactose, sucrose, and enterokinase.
 - (d) None of these choices.
 - (e) enterokinase, amylase, and lipase.
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Part II: (Short notes) Please answer the following questions: (5 point each)
Discuss the significance of O₂-Hb dissociation curve portions, and the factors affecting the curve (with drawing).

2) Discuss the tubuloglomerular feedback mechanism.

Discuss the rennin-angiotensin-aldosterone system (RAAS) including the Dual control of aldosterone secretion.

ii) Discuss the factors regulating gastric motility and emptying, in term of mode of regulation and the effect .

Discuss the overall process of carbohydrate digestion and absorption.